

Bay Area Regional ITS Plan Update

DRAFT Streamlining for Use and Maintenance

Prepared for:

Metropolitan Transportation Commission



Prepared by:



**Kimley-Horn
and Associates, Inc.**

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191145015



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1. PROJECT OVERVIEW

MTC is beginning a 10-month process to update the existing Bay Area ITS Plan (Plan), which includes the Regional ITS Architecture, originally published in October 2004. The Bay Area ITS Plan is scheduled for completion in November 2007 in time to inform the 2009 Regional Transportation Plan.

The Bay Area ITS Plan is a tool to help ITS project sponsors develop projects by providing a basic framework for how different ITS projects in the region fit together, encouraging stakeholder involvement in project planning, and promoting the use of common design and communication standards. A major goal of the Plan is the integration of ITS projects so that data can be cost-effectively shared between projects. The Architecture portion of the Plan is important because, per federal law, most ITS projects must demonstrate that they comply with the Architecture in order to receive federal funds.

MTC and their consultants, Kimley-Horn and Associates, Inc. (KHA) are updating the ITS Plan to make it current, to meet new federal requirements and to make it a more user-friendly planning document. As part of the update, KHA will be writing a series of memorandums to provide in-depth analysis of different sections of the Plan. This is the second memo in the series, which will discuss streamlining the Regional Architecture for ease of use and maintenance purposes.

2. REPORT OVERVIEW

The purpose of this report is to explore alternative approaches to organizing the Bay Area ITS Plan so that it can better meet the needs of the people responsible for ITS project design and funding. The document is organized into the following sections:

Section 3: Project Definition

Section 4: Peer Architectures Review

Section 5: Assessment of the Existing Bay Area ITS Plan

Section 6: Streamlining Recommendation Summary

3. PROJECT DEFINITION

The Bay Area ITS Plan is an important planning document guiding the coordination of ITS project implementation and providing a framework for ITS project integration. It should provide useful information for project planning, design, and procurement staff. In the Bay Area, the ITS stakeholders have not taken full advantage of the ITS Plan and used it to its full potential. A recent survey conducted as part of the first stakeholder workshop for the ITS Plan Update found that about half of the 32 stakeholders who participated have not used the existing ITS Plan.

In order to enhance the usage of the ITS Plan and accommodate stakeholders' recommendations, MTC and KHA have conducted streamlining research and explored alternative approaches to organizing the ITS Plan so that it better meets the needs of its stakeholders. The streamlining recommendations are based on findings from two steps. First, three regional ITS architectures have been selected from regions with a similar level of ITS advancement to that of the Bay Area. These architectures were reviewed for organization and usability for potential applications to the Bay Area ITS Plan. Second, each section in the existing Bay Area ITS Plan was critiqued to

determine whether it is useful and pertinent to ITS planning and programming and whether it can be improved to serve the purpose better. Based on findings from these two steps and careful consideration of the stakeholders' inputs, the ITS Plan streamlining recommendations are summarized in Section 6.

4. PEER ARCHITECTURES REVIEW

Numerous regional ITS architectures have been completed in the United States since they were required by the federal government for ITS project deployment. To assist and regulate the development effort, FHWA published the *Regional ITS Architecture Guidance – Developing, Using, and Maintaining an ITS Architecture in Your Region*¹ (FHWA Guidance) as a general guide to help each region develop an ITS architecture that suits the region's needs. The FHWA Guidance has stipulated that many architecture components, such as ITS stakeholders, ITS inventory, and ITS services, are required for every ITS architecture before it can be approved by FHWA. Currently, most existing ITS architectures in the nation take the form of a text document and list all the required architecture components in almost identical styles and sequences as introduced in the FHWA Guidance.

Similar to what has been reflected in the Bay Area, people start to explore innovative ways to improve the ITS architectures to make them a more useful planning tool. Some recent efforts have been identified to reform the ITS architectures so that it can present the required information in a more accessible format. These efforts focus on providing in-depth user guides oriented to non-ITS professionals, simplifying steps needed by the users to find pertinent information, and taking advantage of the internet to make the architectures easier to access and reference. These reforming efforts are exemplified in the following three regional ITS architectures:

4.1 Northern Virginia Centric ITS Architecture²

This ITS architecture was selected for review due to the region's similarity to the Bay Area with reference to ITS deployment and urban congestion issues. The following two points stand out for potential application to the Bay Area ITS Plan.

1. This architecture was not published as a traditional text report. It was released as a completely web-based ITS architecture, which has all the information published on the project website and organized for easy reference. The major architecture components, including stakeholders, system inventory, and market packages are presented as interconnected and dynamic links in alphabetic order. Through these interconnected and dynamic links, users can reference all related information they need easily and quickly. For example, the Virginia Statewide 511 is listed in the ITS inventory as a dynamic link. From this link, users can find succinct information regarding this project's status, definition, stakeholders, the systems interconnected with the 511 System, interconnect and information flow diagrams of the 511 System, and how the 511 System maps to the National ITS Architecture. All information is presented as dynamic links so users can find more detailed information, such as explanations of technical terms, if needed. In addition, users can better understand how the ITS architecture is organized and how different ITS projects are related to each other as they navigate through the links.
2. This website contains a simple and non-technical guide on how to use the website (architecture) for different purposes, such as exploring new ITS ideas, identifying funding,

¹ http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/13598.pdf, FHWA, 2001

² <http://www.vdot-itsarch.com/Default.htm>, Virginia DOT teamed with Battelle, 2006

and implementing projects. While users navigate through the website, this link is always present on the page for easy access. In addition, questions regarding how to use the architecture are not answered in long documents, but are provided in short tutorial videos that the users can watch online or download, which makes it much more user friendly and easier to understand. In addition, the website also provides information regarding hands-on training courses for “Using NoVA ITS Architecture” which has proven to be successful and welcomed by the ITS stakeholders.

4.2 California Statewide ITS Architecture³

This ITS architecture was selected for review due to its similar complexity of the documented ITS systems to that of the Bay Area, the way it used dynamic links to make the architecture online accessible, use of market package diagrams to simplify information flow diagrams, and a non-technical executive summary that successfully demonstrates at a high level how to use the architecture. The applicable points are summarized below.

1. For each Caltrans District and Planning Region, the architecture website provides dynamic links to the ITS inventory both by the stakeholders who own these projects and by the ITS entities in the National ITS Architecture to which the project is mapped. For each project in the inventory, users can find project status, description, stakeholder, functionality, and complete and one-to-one diagrams of information flows involving the project. The dynamic links are used to navigate to all the connected systems for more information. The online access of architecture components provides easy and quick reference to all of the information. Users can also obtain a clearer picture of how the architecture is organized and how the agencies and projects share information.
2. For each stakeholder, the website provides a series of market package diagrams that displays how the agency exchanges information to provide a specific service. Compared to information flow diagrams, market package diagrams break down the numerous information flow lines in one information flow diagram by the services provided to the public; therefore, they are much more readable and understandable. Market package diagrams are a more user-friendly and straightforward way to present how information flows between projects as well as each stakeholder’s roles and responsibilities.
3. *Inside the California ITS Architecture* is a brief, easy-to-understand, and non-technical brochure designed to guide ITS stakeholders how to use the Architecture and also serves as an executive summary for the Architecture. The independent executive summary has proven to be a very successful feature of the California Statewide ITS Architecture to make the document more usable, more understandable, and more accessible.

4.3 San Diego Regional ITS Architecture⁴

This ITS Architecture was selected to review due to the region’s similarity to the Bay Area in transportation characteristics. This architecture is also unique in that it was presented in two versions. One is the detailed 107-page architecture report, and another is a compacted 12-page summary inserted as an appendix to the San Diego Regional Transportation Plan (RTP).

1. The compacted architecture in the RTP appendix highlighted the information included in the detailed Regional ITS Architecture report and interested parties were referred to the

³ <http://www.kimley-horn.com/CAArchitecture/>, Caltrans teamed with KHA., 2004

⁴ Detailed Report: http://www.sandag.org/uploads/publicationid/publicationid_870_1974.pdf, SANDAG teamed with NET & URS, 2003.

Summarized Appendix: http://www.sandag.org/uploads/publicationid/publicationid_903_5055.pdf, Mobility 2030 San Diego Regional Transportation Plan, Appendix 6, 2003

appropriate documentation. It also identified the major regional systems and summarized the basic functional services and major types of data from the system and the types of agencies likely to share these functions/data. This document provided a high-level overview of the most important ITS projects in the region. For users interested in finding more information, this document provided an index leading to the relevant information. The detailed report became easier to use with the assistance of the compacted report.

5. ASSESSMENT OF THE EXISTING BAY AREA ITS PLAN

The purpose of this section is to assess each section of the existing ITS Plan, and identify its purpose, whether it is required by federal regulations, whether it can be reorganized or eliminated, and the potential ways to improve its usability.

Executive Summary – Though not specifically required by any regulations, the Executive Summary is useful for a variety of stakeholders, including both policy-makers and technical implementers, to understand the development process and the primary outcomes of the ITS Plan. This section should remain in the updated ITS Plan, but needs to be divided into two deliverables. Based on the success of San Diego's policy summary in the RTP, a policy summary and a technical summary appeals to the varied uses of stakeholders.

1. Introduction – The existing Introduction discusses both the background and purpose of the ITS Plan and the organization of the document. These contents are necessary to introduce the ITS Plan. The updated ITS Plan should keep and rewrite this section to focus on what has been changed in the update.

2. Bay Area ITS Focus – This section was intended primarily for policy makers. It lists the policy goals of the RTP and relates them to the ITS Action Goals to prove the consistency between these two regional planning documents. This section should be kept and rewritten to focus on how the findings in the updated ITS Plan will feed back to the RTP to assist the RTP update in 2009.

3. Regional Boundaries – FHWA Guidance requires proper definition of the project boundary and timeframe for ITS architectures. The information in the section should be kept, compacted, and updated.

4. ITS Inventory – This is a federally required section and the information must be kept in the updated ITS Plan. However, the introduction of this section needs to be more understandable and more suitable to project planning and design staff. In the updated ITS Plan, the inventory documenting all existing and planned ITS projects should be published on the Internet for easier access and clearer organization, and the terms used to describe it should be less technical.

5. ITS User Needs and Services – This is a federally required section and the information must be kept in the updated ITS Plan. The explanation of ITS technical terms, market packages, and associated diagrams should be provided as dynamic links to the up-to-date National ITS Architecture website.

6. Operational Concepts – This is a federally required section and the information must be kept in the updated ITS Plan. The information should be published on the Internet and should be easily referenced by stakeholders so that each agency can quickly find its roles and responsibilities in ITS operation. The operational concepts will be organized by stakeholder, which will allow agencies to quickly access all operational concepts pertinent to their agency.

7. Functional Requirements – This is a federally required section and the information must be kept in the updated ITS Plan. This information should be published on the Internet and should be

referenced by ITS projects so that stakeholders can quickly find out the required functions for their ITS project.

8. High-Level Architecture – This section corresponds to the Physical Architecture concept in the National ITS Architecture. It summarizes the information flows in the entire Bay Area ITS systems. The high-level architecture diagrams in this section should be kept and updated to provide a high level summary of how ITS projects interconnect with each other in the Bay Area.

9. Relevant Standards – This is a federally required section and the information must be kept in the updated ITS Plan. The general introduction regarding ITS standards, such as the standards development organizations, should be provided as links to the corresponding content in the National ITS Architecture or other ITS Standard website. Because of the constant change in standards, all standards should be presented as dynamic links to its official standards release website.

10. Regional Bay Area ITS Projects – This section identifies a list of ITS projects needed to build out the Architecture and their general logical implementation sequence. This is a federally required section and the information must be kept in the updated ITS Plan. This information should be updated and published on the Internet with dynamic links to each project's participating agencies and associated market package.

11. Regional Perspectives – This section is not required by FHWA Guidance and will be eliminated. Its information, however, should be rewritten and reorganized into the executive summaries oriented to technical stakeholders and policy makers. The language should be modified to suit the different needs of the different audiences.

12. Agency Agreements – This is a federally required section and the information must be kept in the updated ITS Plan. The information should be updated. General background information regarding ITS agreements should be provided as links to the National ITS Architecture or other resources.

13. Use and Maintenance of the Architecture – This is a federally required section and the information must be kept in the updated ITS Plan. This section should be reorganized to include a user guide tailored for different kinds of architecture users available on the website. The architecture maintenance should be organized into a series of Frequently Asked Questions with plain language answers. General background information regarding architecture maintenance should be provided by links to the National ITS Architecture.

Appendix A: List of Acronyms – This section will be kept, updated, and published on the Internet. All the technical acronyms used in the updated ITS Plan will be presented as dynamic links to this page for easy reference.

Appendix B: List of Stakeholders – This section will be kept, updated, and published on the Internet. Users should be able to refer to stakeholder lists by different sorting options.

Appendix C: Bay Area ITS Inventory (sorted by stakeholder agency)

Appendix D: Bay Area ITS Inventory (sorted by architecture entity)

Appendix E: Bay Area Market Package Descriptions

Appendix F: Bay Area ITS Inventory and Market Packages

Information in Appendices C, D, E, and F should be kept, updated, combined, and published on the Internet. Users should be given choices to view the ITS inventory by stakeholder, architecture

entities, or market packages. Each market package should be presented as a dynamic link to its introduction in the National ITS Architecture.

Appendix G: Interconnects and Information Flows – These diagrams should be kept, updated, and published on the Internet with each project in the ITS Inventory. When users select to see a project, interconnect and information flow diagram should be presented as well.

Appendix H: Detailed Listing of NTCIP Standards for the Bay Area – This information should be kept, updated, and presented with each project in the ITS Inventory. The information flow should be listed with link to its associated standards.

Appendix I: National ITS Architecture Updates – This section does not apply any more and should be eliminated.

Appendix J: Turbo Architecture Updates – This section does not apply any more and should be eliminated.

6. STREAMLINING RECOMMENDATION SUMMARY

The streamlining recommendations are presented in the following two options.

Option 1: Web-Based Dynamic Plan

Based on the high-level review of three regional ITS architectures regarding their innovative reforming practices and the assessment of each section in the existing Bay Area Regional ITS Plan, it is recommended that the Bay Area Regional ITS Plan consider the following streamlining actions as part of the web-based option so that it can better meet the needs of ITS stakeholders:

1. The updated ITS Plan should include a user guide written in plain and non-technical language oriented to project stakeholders regarding how to use the ITS Plan for project planning, design, procurement, operations, and retirement or replacement of the technology. It is suggested that the user guide take advantage of dynamic links so that users can easily find relevant information as they read through the guide. Potential technical terms should be used as dynamic links to official ITS architecture knowledge reference websites, such as the National ITS Architecture, for explanations. The Northern Virginia and California Statewide Architectures both use a non-technical document to explain the architecture that has been met with positive results. Stakeholders seem to prefer plain language communication that is not wrapped up with ITS jargon.
2. The updated ITS Plan should be web-based with two printable executive summaries. Most of the Plan, including the architecture components, should be presented using linked websites. All the information should be interconnected to each other so that a user can identify the connections among these components and find pertinent information quickly and easily. The website should be easy to navigate and intuitive to use. When appropriate, links to outside resources should be used to further explain terms or provide guidance. The organization of the data by project and by stakeholder and the internet imbedded search-within-page function will also make it much easier to locate detailed information and find where a specific project fits in the ITS framework. The two executive summaries will be oriented to different audiences, one to policy makers and the other ITS stakeholders. These will be published on the website as text documents. The Northern Virginia Architecture uses this as their model, and this

approach is also supported by survey results of Bay Area stakeholders. In a survey of local Bay Area stakeholders, many people asked for an online accessible and interactive plan.

3. Currently, most ITS architectures in the nation are system-based, which can be difficult for the stakeholders to understand and reference. The ITS Plan will be project-based to be relevant to a larger group of stakeholders. The project inventory and market package diagrams will be project based, which allows agencies to find their specific project and associated information flows with little interpretation. Agencies think in terms of projects, not systems. It is difficult for a project-based agency to determine if their project is in conformance with the Regional Architecture if they do not understand how their project fits into the system. A project based plan is more user-friendly.
4. In addition to the interconnect and information flow diagrams required by the federal government, the updated ITS Plan should provide customized market package diagrams to illustrate the connection among ITS projects in an easier to understand way. An information flow diagram for a project may contain hundreds of information flow lines showing every piece of information being exchanged between this project and the rest of Bay Area ITS. The information flow diagrams are often difficult to read. Customized market package diagrams, however, divide the information flow diagrams by services and each market package diagram will only show a portion of the information flow related to the project. This will significantly reduce the complexity and increase the usability of the diagrams. For example, **Figure 1** shows the information flow diagram of I-580 ATMS System and **Figure 2** shows the customized market package diagram of I-580 ATMS System with respect to network monitoring. Not only is **Figure 2** more understandable than **Figure 1**, it can also provide better usability since users usually refer to these diagrams to find information associated with certain aspects of ITS service.

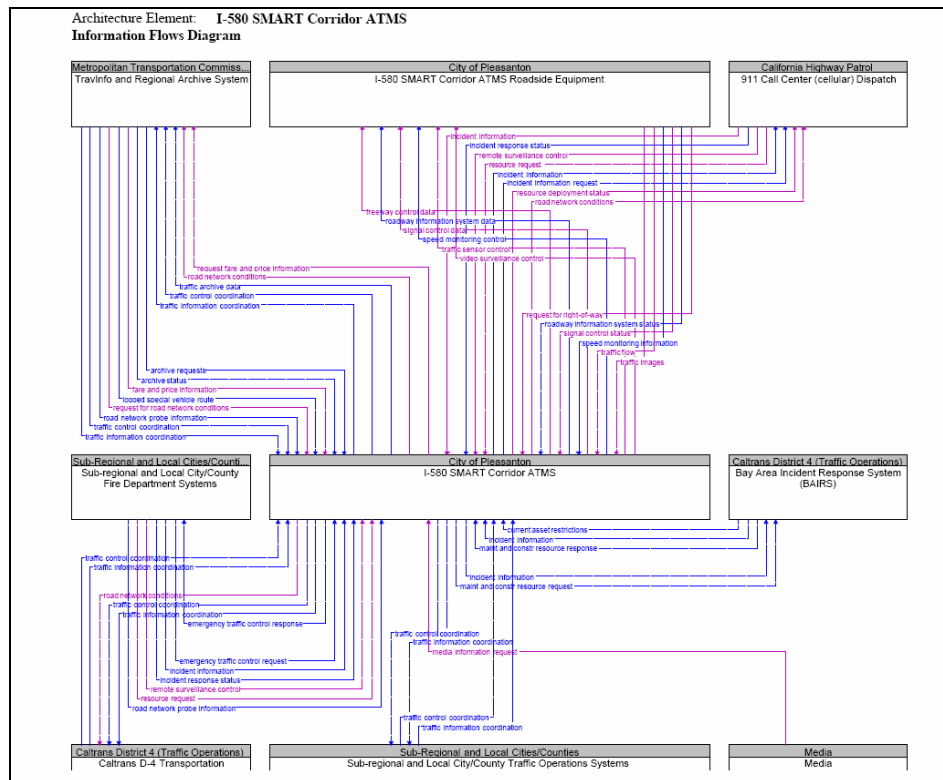


Figure 1: Information Flow Diagram for I-580 Smart Corridor ATMS

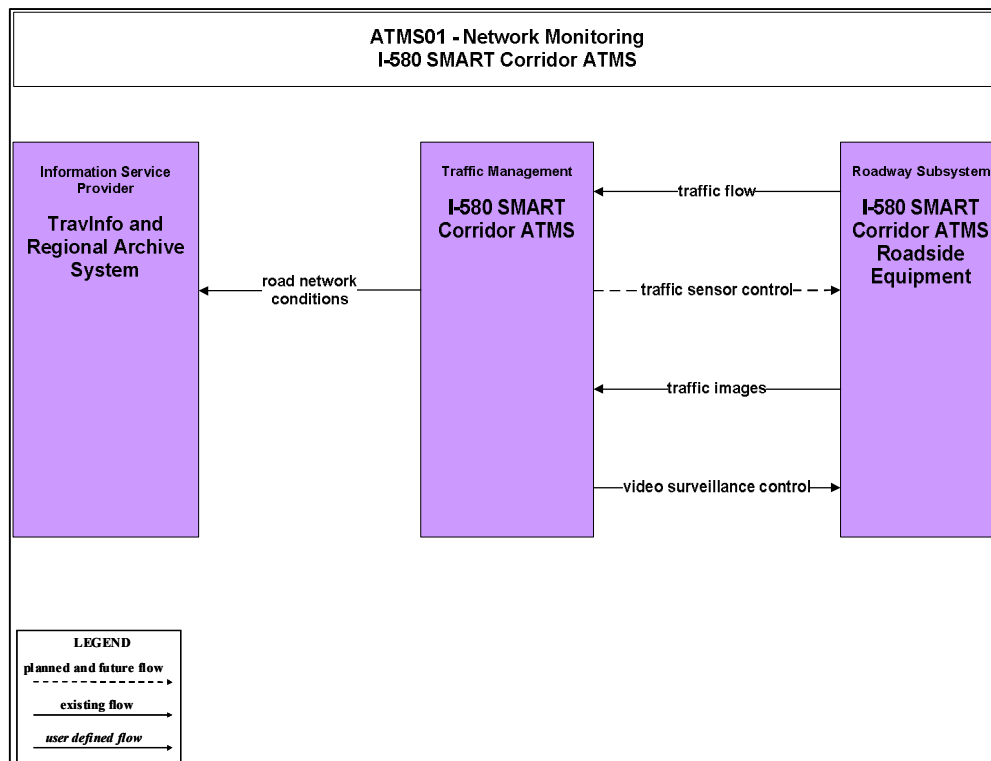


Figure 2: Market Package Diagram for I-580 Smart Corridor ATMS –ATMS 01

Option 2: Print-Based Document

Option 2 maintains the status quo of a print-based document posted on MTC's website. Every component within the ITS Plan will keep the original format with updated information. The document will be published on MTC's website to be downloaded as PDF file. An ITS Architecture database will also be published as Turbo Architecture file on the website.

The major trade-off between the print-based document and the web-based approach is the accessibility of the information. The print-based document uses a table of contents as the main portal to the information. The web-based version is fully linked and interconnected. For example, when reading the print-based version, if the user has a question about what a market package is, he or she will flip back to the table of contents to find the definitions section, and turn to that section for the answer. Using the web-based version, the user would click on the word "market package" and the definition will be linked to the word. The content of the print-based and web-based versions will be the same. Our recommendation is to choose Option 1 because the current plan is underutilized and perceived as inaccessible. Option 1 is more user-friendly because people not familiar with ITS Plans or architectures will have an easier time navigating and finding the information they need.

7. CONCLUSION

The recommendations introduced in this document will be reviewed by MTC and the Steering Committee. Upon approval and consensus on the recommendation, the Bay Area ITS Plan update will follow the recommendation to create a planning tool that is easy to use and access by all ITS stakeholders. For Option 1, recommendations 1, 3, and 4 do not change any of the deliverables outlined in the existing scope; recommendation 2, the online accessible plan, only changes the scope where it references the delivery method. For Option 2, the Bay Area ITS Plan will remain in the same format and style as the current Plan. The final documentation will not be delivered as a print-ready pdf file, but instead as html files ready to post. The references to the number of pages of each section in the final Plan become references to webpages, not printable pages. No other changes to the scope are foreseen at this time.